C·R·E·S®

CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

REPORT

WINTER 1993/1994

Moving Toward Our Mission

As in years past, I am both proud and amazed at the volume and high caliber of research, conservation projects, and activities carried out this year by CRES staff, often in collaboration with Zoo and Wild Animal Park veterinary services and animal care staffs, and despite significant resource limitations. This issue of *CRES Report* gives an overview of the efforts and accomplishments of the CRES divisions for 1993.

As CRES scientists, our mission is to gather, develop, and increase knowledge vital for the establishment of self-sustaining populations of wildlife. Poised as we are at the brink of the extinction of an increasing number of life-forms, our challenge is a considerable one. With the resources available to us, only a few endangered species can be saved. Our activities are intended to conserve those species, with their behavioral and genetic characteristics intact.

For many species there is alarmingly little time remaining in order to collect the necessary biological information. How does one predict the time of ovulation for giant pandas? How can we improve the diagnoses of deadly diseases such as malignant catarrhal fever, which attacks herds of wild and domestic hoofed stock? Under what conditions can semen of northern white rhinoceroses be successfully cryopreserved and later thawed for artificial insemination?

Questions like these seem baffling, but CRES scientists are working against the clock to provide answers to these and dozens of equally daunting problems. The work is painstaking, often frustrating, but the rewards are immense. What greater gift can be given to the children of future generations than a legacy of living animals with which we have been privileged to share the earth?

Our sense of contribution and worthwhile purpose to reverse the plight of endangered species stems from facts and reliable knowledge established by research. We have, above all, an appreciation for the value of the life-forms we evaluate, for the scientific, practical, and educational benefits of our research, and for the cooperative assistance necessary to accomplish and share this work.

Each staff member from every division of CRES can relate distinctive, professional contributions and notable successes that occurred here

CRES Director Dr. Heuschele (far left) chairs staff meetings.

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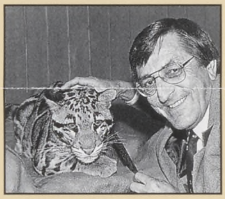
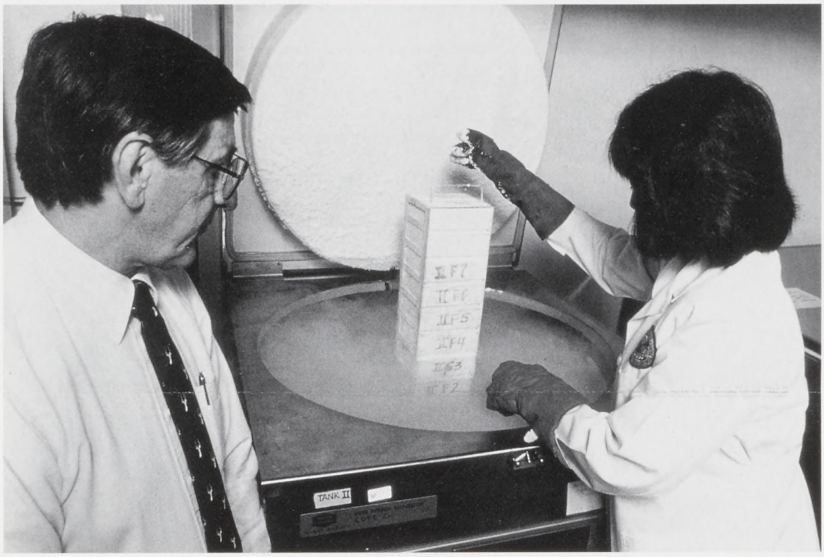


Dr. Werner P. Heuschele
CRES Director receives award. See page 2.

Adopt-An-Animal
Add a white tiger to your holiday list! See page 5.

Keeping Koalas Healthy
Retrovirus studies continue. See page 4.



The Frozen Zoo, nicknamed the "20th Century Ark," is the CRES cell bank repository for more than 2,000 individual animals representing approximately 350 endangered species. It is a liquid nitrogen tank that looks like a washing machine and is maintained at 196 degrees below zero centigrade. Dr. Werner Heuschele and Cytogenetics Specialist Arlene Kumamoto examine samples from the Frozen Zoo.

Continued from page 1

first. We are not alone in these endeavors, but we are clearly out in front, and it is not by accident.

That CRES has become a world-renowned model for the multidisciplinary benefits of zoological research is a tribute not only to the scientists but also to the donors and volunteers who share in the success of our accomplishments. Many of our CRES projects are supported by monetary gifts, bequests, and grants from individuals, foundations, and family trusts. Many projects are aided by volunteers, whom we thank for their dedication and contributions. We are all truly grateful for this much-needed support of our work that is so important to the survival of many endangered animal species.

— Werner Heuschele
CRES Director

ABOUT THE AUTHOR: WERNER P. HEUSCHELE, D.V.M., Ph.D.

Dr. Werner Heuschele began his career at the San Diego Zoo in 1947, as a Zoo bus driver/tour guide, while attending San Diego State University. Immediately after obtaining his D.V.M. degree from the University of California at Davis School of Veterinary Medicine in 1956, he was appointed veterinarian and hospital manager for the San Diego Zoo, where he also worked as a pathologist.

An interest in infectious diseases—particularly in exotic animals—led Dr. Heuschele to leave San Diego in 1961 for an active veterinary research career with the U.S. Department of Agriculture's Plum Island Disease Laboratory in New York. His studies included research on rinderpest, bovine ephemeral fever, and African swine fever, which led him to Kenya for two years. Today, Dr. Heuschele is considered an authority on bovine viral diseases, especially malignant catarrhal fever and bovine viral diarrhea, foreign animal diseases, and zoonotic diseases.

Dr. Heuschele began an academic career in 1970, soon after he finished his Ph.D. studies at the University of Wisconsin in the combined areas of microbiology, virology, and immunology in 1969. In 1976, as professor in the Department of Veterinary Preventive Medicine at Ohio State University, he taught, developed courses in zoo animal and wildlife medicine, and conducted infectious disease research.

In 1981, Dr. Heuschele returned to the San Diego Zoo as head of virus disease research for CRES, focusing his studies on malignant catarrhal fever, a herpesviral disease of domestic cattle and many wild ruminant species. He was appointed director of research at CRES in 1986, where he oversees the research programs of eight principal investigators, as well as pursuing his own research.

In addition to his role as CRES director, he has served as a consultant to several animal health product firms. His expertise and advice on infectious diseases of livestock and exotic animals are often sought by the USDA, the Food and Agriculture Organization of the United Nations, the National Academy of Sciences, the National Commission for Wildlife Conservation and Development of the Kingdom of Saudi Arabia, the Australian Koala Foundation, and other zoos. He is a member of two special committees relating to animal health of the National Research Council, Board on Agriculture, and is affiliated with several professional organizations.

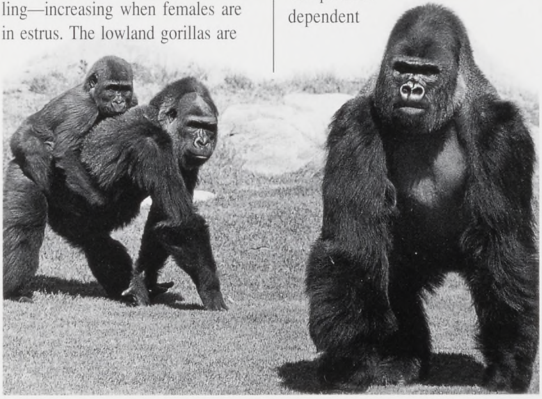
Dr. Heuschele's commitment to research is recognized by the scientific community through a number of honors and awards, including the Alumni Achievement Award for 1991 from the School of Veterinary Medicine, University of California at Davis, and the 1993 award of life membership in the American Association of Zoo Veterinarians. His publications contribution has been phenomenal, and his work in the areas of care, treatment, and diagnosis in exotic animal medicine has led to advances in the field. Dr. Heuschele has been called a mentor by other zoo veterinarians, who have looked to him for guidance in the field.

Behavior

Cheetahs and primates were the focus of studies for the behavior division team of Dr. Donald Lindburg, Helena Fitch-Snyder, Susan Millard, and Drs. Nancy Harvey and Jacqueline Ogden. Cheetah reproduction is still being investigated, because more than 90 percent of the males have reproduced but the rate for females is under 50 percent. One area of interest is to determine the role female proximity may play in the suppression of estrus behavior and ovulation in noncycling females. Another program is designed to study the effects of regularly scheduled exercise to improve overall condition in cheetahs. Lion-tailed macaques were observed for their responses to "toys" and fresh-cut browse as forms of enrichment that lead to greater psychological health. Also, their social interactions at night are being compared with daytime activities. Nighttime activity has been found to be strongly affected by the females' reproductive condition, with male activity—such as mate guarding and patrolling—increasing when females are in estrus. The lowland gorillas are part of a birth management study, as well as one on social spacing when pregnant females are present. Another project under preparation monitors environmental control for the gorillas. Through a high-tech sound system in their exhibit that is linked to sensor devices, the gorillas will be able to control the production of sounds by their presence in a particular area. Exhibit exploration in naturalistic enclosures is being compared between gorillas and bonobos (pygmy chimpanzees); and suggested differences in social behavior between the two subspecies of orangutans are being investigated through a multi-institutional study that involves about ten other zoos. Communication through infrasonic sounds in elephants is another major project that identifies calls, callers, and the behavioral and social contexts of calling in Asian and African elephants, which will be useful as a management tool.

Endocrinology

Reptiles and large mammals—gorillas, giant pandas, rhinos, walrus, and okapi—were the focus of studies for this division. Dr. Valentine Lance is continuing studies with desert tortoise reproduction at the research center in Las Vegas, Nevada, comparing the reproduction of captive tortoises with those of free-ranging tortoises fitted with radio transmitters. Temperature-dependent sex determination in reptiles is part of two projects: the collaborative study of giant river turtles in Colombia and the reproductive biology of sea turtles in Costa Rica. The Indian gharial is part of an ongoing study to identify sex in immature individuals, using a hormonal method developed at CRES. Nancy Czekala-Gruber is moving ahead with her fecal and urine sample studies for mountain gorillas, giant pandas, Sumatran and northern white rhinos, the walrus, and the okapi, all of which should lead to a better understanding of reproduction and infertility with these species.



Genetics

Current projects for the genetics division team of Dr. Oliver Ryder, Leona Chemnick, molecular genetics specialist, Dr. Yaping Zhang, postdoctoral fellow, and Dawn Fields, UCSD graduate student, include molecular evolutionary studies for the giant panda, paternity analysis for gorillas, rhinoceros chromosomal studies, Rhino Conservation Strategic Planning, and the Przewalski's horse reintroduction program in Mongolia, which extends to the establishment of collaborative research projects—for wild camels, Gobi bears, and argali sheep—with the Mongolian Academy of Sciences. While the mountain gorillas of Rwanda have been intensely studied by scientists for more than two decades, only recently have molecular studies been attempted. Taking advantage of advances made in human genetics, it is now possible to find DNA markers that vary even among closely related gorillas. These markers are being used to determine paternity for six offspring born into one of the most extensively studied groups of mountain gorillas. These gorilla genetic studies will underpin behavioral studies by trying to document gene flow among these gorillas and clarify paternity. These markers may also aid in a positive identification of gorillas lost to poaching. Collaborative research with the Kenya Wildlife Services and the National Museums of Kenya (NMK) is underway that will increase the technical capabilities of scientists there and lead to better genetic management for black rhinos living in sanctuaries. For free-ranging populations, new techniques for genetic monitoring will be jointly developed at CRES and NMK and applied in support of the National Conservation Strategy for the black rhino in Kenya. This project addresses technical needs for global conservation programs in support of other populations of African and Asian rhinos.

Cytogenetics

Populations of Asian gazelles, particularly in the Middle East, have suffered declines because of competition from domestic livestock, hunting, and war, but conservation efforts are complicated by the uncertain taxonomy of the genus *Gazella*. Arlene Kumamoto and Steve Kingswood have collaborated with cytogeneticists at the Zoological Society of London and the National Veterinary School of Toulouse to study the chromosomes of several Asian gazelle species. Analyses of chromosomal variation between and within gazelle species can help clarify taxonomic relationships. Knowledge of this variation further aids conservation by identifying biological diversity that may not be apparent by simply noting physical traits. Cytogenetic research on gazelles has been largely possible at CRES because of the representation of gazelle species at the San Diego Zoo and the Wild Animal Park, one of the largest and most diverse collections found in the world. Additionally, Marlys Houck, senior research technician, continues studies on rhinoceroses. She recently made a collecting trip for skin biopsy samples from the highly endangered black rhinos in Zimbabwe.

Infectious Diseases

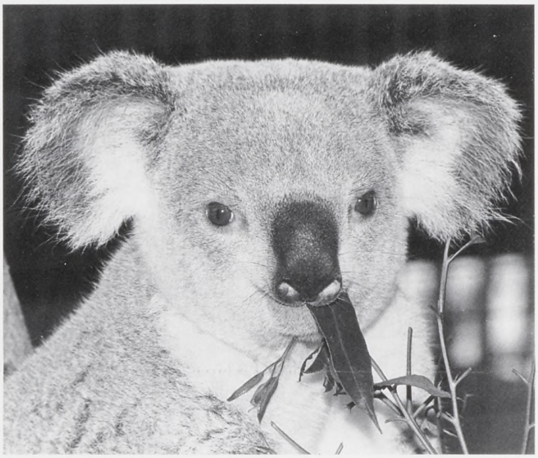
Work continues on the molecular biology of malignant catarrhal fever (MCF) viruses. In the last 12 years, this division has built an extensive collection of serum samples from ruminant species in the course of research on MCF. This disease, caused by several similar viruses, represents a serious threat to concentrated breeding herds of endangered ruminants at the Wild Animal Park. Dr. Roya Lahijani, postdoctoral research fellow, Stacy Sutton, UCSD graduate student in molecular pathology, and Rob Klieforth, senior technician, working in collaboration with Dr. Michael Murphy of the Salk Institute Biotechnology/Industrial Associates (SIBIA), have developed a rapid diagnostic test for MCF using the polymerase chain reaction (PCR) and the MCF virus. Dr. Heuschele is also working with the Phoenix Zoo to gain approval for the importation of giant peccaries from the breeding project in Paraguay. The captive breeding of this peccary was begun in 1985 by Dr. Kurt Benirschke, former director at CRES, in the Chaco region of Paraguay. If successful, this will be the first breeding group of giant peccaries in the United States.

Comparative Physiology

This was a year of change for the comparative physiology division, marked by the culmination of behavioral and physiological research on green iguanas, a renovation of our reptile greenhouse facilities, and the initiation of two new projects. Lori Jackintell joined the division as a research associate, Dr. Allison Alberts was promoted to associate physiologist, and Dr. John Phillips shared his time between comparative physiology and his new position as deputy director of research. In February, we began a project funded by the National Science Foundation to develop strategies for conservation of endangered Cuban rock iguanas on the U.S. Naval Base at Guantanamo Bay. With field technicians Jeff Lemm and Andrew Perry, we spent two months obtaining data on reproductive cycles in wild populations. Artificially incubated hatchlings will be transported to CRES for developmental studies and then returned to the wild next year as part of a head-starting program. Closer to home, we began to investigate the influence of social environment on reproduction in savanna monitor lizards. Monitor lizards reproduce poorly in captivity, possibly because the year-round presence of males is stressful to females. In collaboration with Dr. Pat Morris, associate veterinarian, we are tracking hormone cycles and using ultrasound to examine egg development in females housed with and without males. As a group, large lizards face ever-increasing pressures from poaching, habitat destruction, and the ill effects of non-native species. The more we can learn about how to manage them successfully, both in captivity and in the wild, the better equipped we will be to contribute to their conservation.

Reproductive Physiology

The reproductive physiology team of Dr. Barbara Durrant, Senior Laboratory Technician Marilyn Patton, and Research Fellow Dr. Nancy Pratt continued its germ plasm cryopreservation studies this year. Various freezing and thawing methods were analyzed for semen from species such as the Somali wild ass, the Tonkin sika deer, and the dolphin. The motility of thawed samples is compared and a close examination is made of the membranes surrounding the sperm head (collectively called the acrosome). During cryopreservation, the acrosome may be damaged, yielding sperm incapable of fertilizing an egg. Optimal semen freezing protocols are those that result in maximum motility and minimum acrosomal damage. Many of the semen samples collected at CRES are harvested from animals postmortem. However, until this year, collecting ova in this manner was rarely successful. New studies underway are designed to discover the most efficient way to release all of the female's immature ova from her ovaries after she has died. Thus, even newborns and aging animals, pregnant or out-of-season females can contribute to the Frozen Zoo (germ plasm bank). The immature ova, present in all mammalian ovaries from birth, will be frozen immediately after collection. When needed, they will be thawed, grown, and matured *in vitro*, then fertilized to produce embryos for transfer to recipient females.



Virology/ Immunology

The division's research effort during the past year has focused on health problems of the koala and black rhinoceros. Dr. Michael Worley and Senior Laboratory Technician Ann Carpenter have developed a rapid, sensitive, and specific diagnostic test for a retrovirus that is affecting some individuals in the Society's koala colony. The test, which detects virus in peripheral blood lymphocytes, is being utilized to determine the prevalence of virus infection in isolated populations of wild koalas. The investigators have also molecularly cloned regions of black rhinoceros genes that are believed to be relevant to the health of the species. Molecular clones that represent immune response genes involved with the recognition of infectious agents are being used to determine the level of genetic variation in the North American captive population and in scattered populations of wild rhinoceros from varying ecological zones. Black rhinoceroses suffer from severe deficiencies of several red blood cell enzymes, and these deficiencies are probably associated with liver disease and acute bouts of hemolytic anemia. Utilizing rhinoceros-specific clones for two of the key enzymes, catalase and glutathione-S-transferase, experiments are being conducted to determine the basis for the deficiency of these enzymes.

Adopt a White Tiger!

It's easy and fun to adopt! The animal lover you love is sure to be delighted when they find this unique gift under the tree:

- **A cuddly, plush white tiger toy of their very own**
- **A handsome adoption certificate**
- **Two complimentary guest passes to the San Diego Zoo or San Diego Wild Animal Park**
- **A subscription to *CRES Report***
- **A special gift card to announce your gift adoption.**

And . . . the knowledge that your contribution will help us help the many endangered species at the San Diego Zoo and the San Diego Wild Animal Park.

Why not share a special Holiday Season with someone you love by adopting a white tiger!

Animal adoptions are a great way to celebrate with your family and friends all year long.

- **Why not ring in the New Year with a ring-tailed lemur!**
- **Give that special someone a Valentine's gift they'll be wild about!**
- **Brighten someone's birthday with a sun bear or a rainbow lorikeet!**

NOTE: Naturally, your adopted white tiger will remain at the Zoo or Wild Animal Park in the care of our professional staff. Please be aware that the lives of animals for adoption are subject to unavoidable changes. For that reason, adoptions are offered by species only, not by individual animal.

*Special price good through December 31, 1993.

*Share the wonder of the holidays by giving the **purrfect** gift—a plush white tiger toy.*

ANIMAL ADOPTION APPLICATION

☐ **Yes,** I want to adopt a White Tiger as a gift for:

Name(s) ______________________________

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City ______________ State ________ Zip __________

Please sign the special card announcing my gift adoption as follows:

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Name(s) ______________________________

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(Evening) ______________

☐ Also, please enter my own adoption of a White Tiger at the special rate of $99 for one year.

Please make checks payable to the Zoological Society of San Diego and mail to:

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Adopt-An-Animal Program
P.O. Box 271
San Diego, CA 92112

Orders must reach the San Diego Zoo by December 15th to ensure delivery by Christmas.

☐ Please check here if you'd like more information about our Adopt-An-Animal Program. (AHCR3)

HAPPY HOLIDAYS!

'Twas the night before Christmas,
When all through the Zoo
Not a creature was stirring,
not even a gnu.

Each lory and parakeet
was snug in its nest;
Every bear, frog, and tiger
was enjoying a rest.

For Christmas, as always—
each day of the year,
All the animals wish you
good tidings and cheer.

And to share all that joy with
your friends far and near,
With each someone special
that you hold so dear,

Adopt an Animal, or two,
or three. . .
It's the purrfect gift to go
under their tree!

Happy Holidays from Your Friends at the Zoo!

Grants

Dr. Jacqueline Ogden of the CRES behavior division has been awarded a 1993 Conservation Grant by the **Institute of Museum Services**, a federal agency that offers conservation support to the nation's museums. The $25,000 matching grant will provide support for a study with the purpose of improving the well-being of birds in captivity and for advancing endangered species conservation.

Special thanks to the **John and Beverly Stauffer Foundation** for increasing its support toward the Przewalski's horse reintroduction project. The grant by the Stauffer Foundation will ensure the continued leadership of Dr. Oliver Ryder in the release of this endangered species into protected areas in its native Mongolia.

1993 Success for Celebration

This year's Celebration for the Critters, themed "You Belong in the Zoo," marked a milestone in the 13-year history of the event with the relocation of the party to the Zoo grounds. The Celebration raises funds for CRES and was a product of the very popular Kicks for Critters program started by Rolf Benirschke.

Some 1,400 partygoers enjoyed the festive evening under the stars on September 11. The party area stretched from the Zoo's main plaza down to the new Treehouse complex, and then over to Raintree Grove, the Reptile House, and the Otto Center lot. Guests were treated to the soothing jazz sounds of Ars Nova at the Treehouse and danced the night away to the classic rock of Rockola. There were also food and beverages, a silent auction, and a grand prize drawing for two trips (one to the Berlin Zoo, the other to the Ritz Carlton Hotel in Laguna) and tickets to the Chargers' skybox for the Denver game.

The 1993 event co-chairs were Stephanie Donovan and Ron Oliver, Karen Ladner and Todd Stone, and Rolf and Mary Benirschke. This year's event netted more than $30,000 for CRES research.

CRES REPORT
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EDITOR:
Mary Sekulovich

EDITORIAL ASSISTANT:
Betsy Sanders

SPECIAL THANKS TO CRES CONTRIBUTORS:
Werner Heuschele, D.V.M., Ph.D.
CRES Staff
Judy Kinsell
Joanne Leidenberger
Amy Parrott

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Ron Gordon Garrison

SAN DIEGO ZOO · SAN DIEGO WILD ANIMAL PARK

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Zoological Society of San Diego
Development Department
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